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CITY OF SANTA BARBARA
PLANNING DIVISION

**Preliminary Drainage Analysis
for
WHOLE FOODS MARKET PROJECT
AT APN 051-040-046, 051-040-049,
051-040-052, AND 051-040-053**

City of Santa Barbara, California

April 2006

| | |
|-------------------|---|
| SUBMITTAL TO: | City of Santa Barbara |
| CLIENT: | Regency Centers |
| PREPARED BY: | Penfield & Smith 101 East Victoria Street Santa Barbara, California 93101 (805) 963-9532 |
| WORK ORDER NO.: | 16359.01 |
| PROJECT ENGINEER: | Wayne F. Fitch, P.E. |

The project proposes to direct the majority of the site storm runoff towards the south end of the existing box culvert in Arroyo Burro Creek at the west side of the site. The storm drain pipe shall daylight in the culvert to minimize impacts to the creek bed.

ANALYSIS

The drainage peak runoffs for the 25-year and 100-year storm events were calculated for the sites' pre-development and post-development conditions. The site was calculated to determine the existing impervious surface compared to the proposed impervious surface. The existing impervious surface is 177,300 square feet (4.1 acres) compared to the proposed impervious surface of 154,000 square feet (3.5 acres). The drainage analysis per the Santa Barbara County Rational XL program analyzes the "land-use" of the site and not the amount of impervious surfacing.

The drainage analysis was prepared according to the current Santa Barbara County Flood Control Design Standards. The hydrology calculations used the Santa Barbara County Flood Control and Water Conservation District Rational-XL program. The XL program references the Rational Method ($Q=ciA$), in which "c" is the site runoff coefficient; "i" is the rainfall intensity in inches per hour (in/hr); and "A" is the drainage area in acres.

RESULTS

In utilizing the Rational-XL program, the commercial land use was used for the Pre-Development condition, and the commercial land use was used for Post-Development condition.

"c"-value for 25-year storm event:

For Pre-Development Site: $c = 0.76$

For Post-Development Site: $c = 0.76$

"c"-value for 100-year storm event:

For Pre-Development Site: $c = 0.80$

For Post-Development Site: $c = 0.80$

"i"-value for 25-year storm event: 3.18 in/hr

"i"-value for 100-year storm event: 4.03 in/hr

300 M 34° 28' 07.5 "

LEGEND



SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.



FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.



OTHER FLOOD AREAS

- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.



OTHER AREAS

- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.



COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS



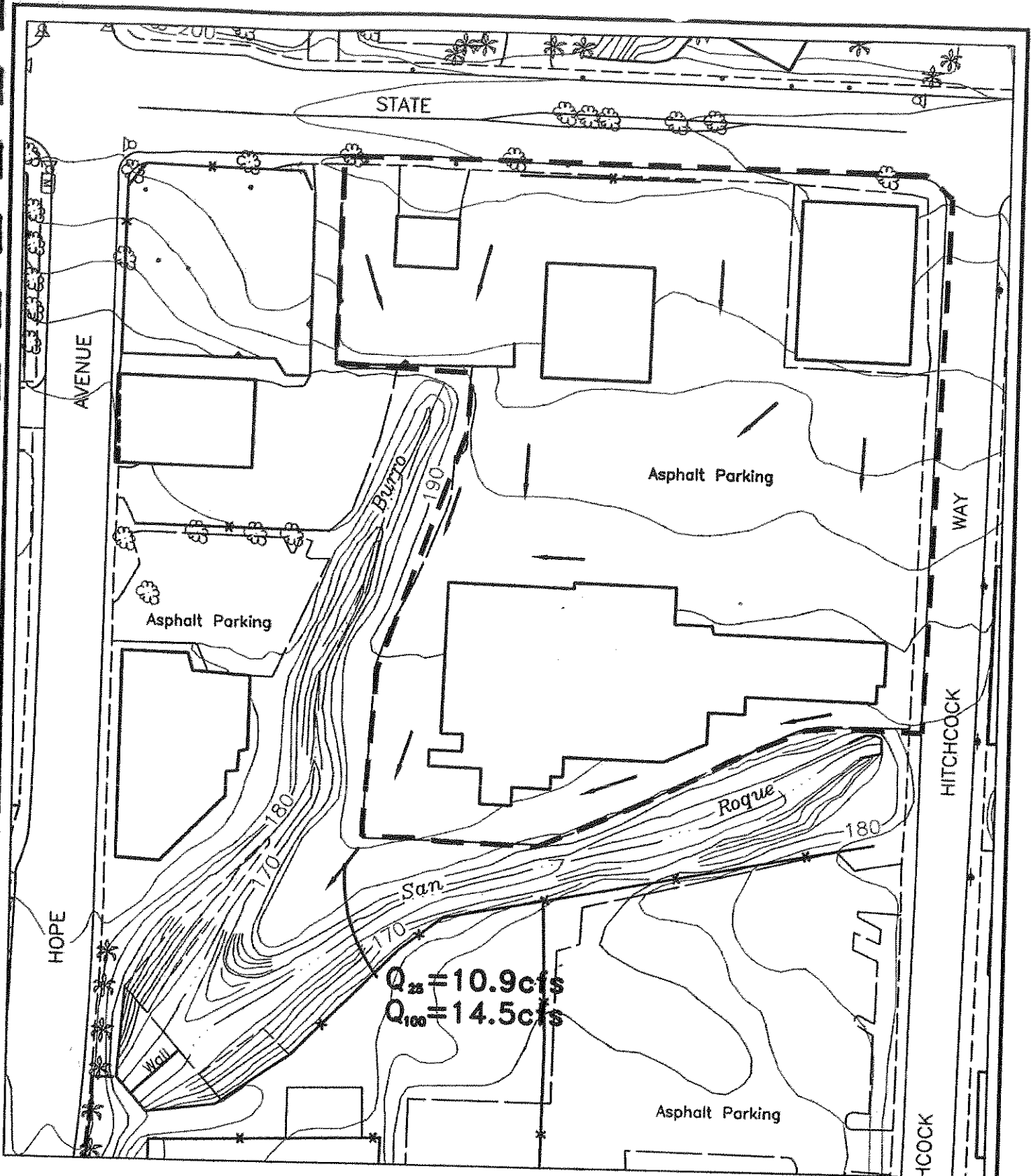
OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- - - - - Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- ~~~~~513~~~~~ Base Flood Elevation line and value; elevation in feet*
- (EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

ATTACHMENT B
Pre-Development Calculations and Drainage Area Map



Penfield & Smith
ENGINEERS • SURVEYORS • PLANNERS

CAMARILLO SANTA BARBARA SANTA MARIA LANCASTER

16359.01

16359eh.dwg

SCALE: 1"=100'

**PRE-DEVELOPMENT
DRAINAGE AREA MAP
WHOLE FOODS PROJECT
CITY OF SANTA BARBARA, CALIFORNIA**

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

| | | | |
|----------------------|-----------------------------|------------------------|----------|
| User Data: | | | |
| Project Name: | Whole Foods | Project Number: | 16359.01 |
| Date of Run: | 10/30/2005 | Run By: | wff |
| Notes: | Post-Development Conditions | | |

| | | | | |
|---|-------------|--------------------------------------|------------|------------|
| Input Data: | | | | |
| Location: | South Coast | Land Use Type: | Commercial | |
| Area (Acres): | 4.5 | Time of Concentration (Min.): | 12 | |
| Calculated Runoff Coefficient: | Q10: 0.73 | Q25: 0.76 | Q50: 0.79 | Q100: 0.80 |
| User Selected Runoff Coefficient (Optional): | | | | Calculate |

| | | | |
|---|-------------------|--------------------|-----------------------|
| For Large Lot Subdivisions (>10,000 sq. ft.): | | | |
| | Low Value: | High Value: | User Selected: |
| Q10: | | | |
| Q25: | | | |
| Q50: | | | |
| Q100: | | | |
| Enter Selection | | | |

| | | | | |
|-----------------|----------------------------|---------------------|-----------------|----------------|
| Results: | | | | |
| | Rainfall Intensity: | Runoff Coef: | Q (cfs): | |
| Q10: | 2.61 | 0.73 | 8.6 | View RI Curves |
| Q25: | 3.18 | 0.76 | 10.9 | Print |
| Q50: | 3.68 | 0.79 | 13.1 | |
| Q100: | 4.03 | 0.80 | 14.5 | |
| | | | | View RC Curves |
| | | | | Exit |

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

| | | | |
|---|-------------|------------------------|----------|
| User Data: | | | |
| Project Name: | Whole Foods | Project Number: | 16359.01 |
| Date of Run: | 4/12/2007 | Run By: | wff |
| Notes: Drainage area to be treated by storm filter system | | | |

| | | | |
|--|-------------|-------------------------------|------------|
| Input Data: | | | |
| Location: | South Coast | Land Use Type: | Commercial |
| Area (Acres): | 4.38 | Time of Concentration (Min.): | 12 |
| Calculated Runoff Coefficient: | Q10: 0.73 | Q25: 0.76 | Q50: 0.79 |
| User Selected Runoff Coefficient (Optional): | | | Q100: 0.80 |
| | | | Calculate |

| | | | |
|--|------------|-------------|-----------------|
| For Large Lot Subdivisions (> 10,000 sq. ft.): | | | |
| | Low Value: | High Value: | User Selected: |
| Q10: | | | |
| Q25: | | | |
| Q50: | | | |
| Q100: | | | |
| | | | Enter Selection |

| | | | |
|-----------------|---------------------|--------------|----------------|
| Results: | | | |
| | Rainfall Intensity: | Runoff Coef: | Q (cfs): |
| Q10: | 2.61 | 0.73 | 8 |
| Q25: | 3.18 | 0.76 | 11 |
| Q50: | 3.68 | 0.79 | 13 |
| Q100: | 4.03 | 0.80 | 14 |
| | | | View RI Curves |
| | | | Print |
| | | | View RC Curves |
| | | | Exit |

CALCULATE TREATMENT FLOW (Q):

$$1) (0.1)(Q_{p50}) = (0.1)ciA = (0.1)(0.79)(3.68)(4.38) = \underline{1.27 \text{ cfs}}$$

PER VENTURA COUNTY TECHNICAL GUIDANCE MANUAL FOR STORMWATER QUALITY CONTROL MEASURE

2) FLOW BASED B.M.P. PER CALIF. STORMWATER BMP HANDBOOK

$$Q = ciA : \underline{I = 0.14\%}; \text{ OXNARD EQUIPMENT YARD, CUMULATIVE FREQUENCY}$$

HOURLY RAINFALL INTENSITY AT 85%

$$C = 0.858 i_R^3 - 0.78 i_R^2 + 0.774 i_R + 0.04$$

$$= 0.858 (0.6)^3 - 0.78 (0.6)^2 + 0.774 (0.6) + 0.04$$

$$= 0.185 - 0.28 + 0.464 + 0.04$$

$$= \underline{0.41}$$

i_R = IMPERVIOUS RATIO

$$Q = (0.41)(0.14)(3.68) = 0.21 \text{ cfs}$$

USE STANDARD SAFETY FACTOR OF 2 $\Rightarrow Q = 0.42 \text{ cfs} < 1.27 \text{ cfs}$ (THE ABOVE VENTURA COUNTY METHOD GOVERNS)

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PLANNING DIVISION

PROPOSED SITE STORMWATER QUANTITY

THE SITE DEVELOPMENT WILL REDUCE THE IMPERVIOUS AREA FROM 177,300 SQUARE FEET (OR 79% OF THE SITE) FOR THE PRE-DEVELOPMENT CONDITION TO 156,000 SQUARE FEET (OR 70% OF THE SITE) FOR THE POST-DEVELOPMENT CONDITION. NO DRAINAGE RUNOFF WILL INCREASE FROM THE PROJECT DEVELOPMENT.

PROPOSED SITE STORMWATER TREATMENT

| PROJECT AREA | AREA, SF | % OF TOTAL |
|--|----------|---------------|
| CREEKS (NO TREATMENT NECESSARY) | | |
| FILTER SWALE BETWEEN CONDO AND TOP OF CREEK | 33024 | 15% |
| PARKING LOT FILTER STRIPS | 26681 | 12% |
| PERMEABLE PAVED DRIVEWAY | 21176 | 9% |
| EASTERN BUILDING DRAINING TO LANDSCAPING | 8431 | 4% |
| NORTHERN BUILDING DRAINING TO LANDSCAPING | 9120 | 4% |
| (THROUGH BUBBLER) | | |
| LANDSCAPE PLANTING AREA | 15225 | 7% |
| | 1193 | 1% |
| SUBTOTAL OF SURFACE FILTERED AREAS | 114850 | 52% |
| DRAINING TO CATCHBASIN INSERT FILTERS | 59012 | 26% |
| REMAINING SITE CLEANED BY MECHANICAL STORMWATER FILTER | 49997 | 22% |
| TOTAL SITE AREA | 223859 | 100% |

PLEASE NOTE THAT SOME PORTIONS OF THE DEVELOPED SITE ARE PASSED THROUGH MORE THAN ONE STORM WATER TREATMENT BMP, AND ALL PORTIONS OF THE DEVELOPED SITE PASS THROUGH AT LEAST ONE TYPE OF STORM WATER TREATMENT FILTER.

190,855

4,380 ac